



Coastal Processes Affecting Larval Supply into Florida Bay: Snappers (Pisces: Lutjanidae)

David L. Jones¹, Monica R. Lara¹, Cynthia Yeung¹, Maria M. Criales¹, Thomas L. Jackson², & William J. Richards²

¹University of Miami–RSMAS, Miami, FL; ²NOAA–NMFS Southeast Fisheries Science Ctr, Miami, FL



INTRODUCTION

Snappers of the genus *Lutjanus* annually form offshore spawning aggregations in waters off the Dry Tortugas. After an off-shore pelagic larval phase, these fishes settle to juvenile nursery habitat within Florida Bay. Mesoscale oceanographic processes are important for retention and transport of larvae, providing crucial links between the pelagic larval habitat and demersal juvenile nurseries.

The influx of snapper larvae into Florida Bay was monitored to determine the variability of larval supply and examine the relationship between larval influx and environmental/oceanographic variables.

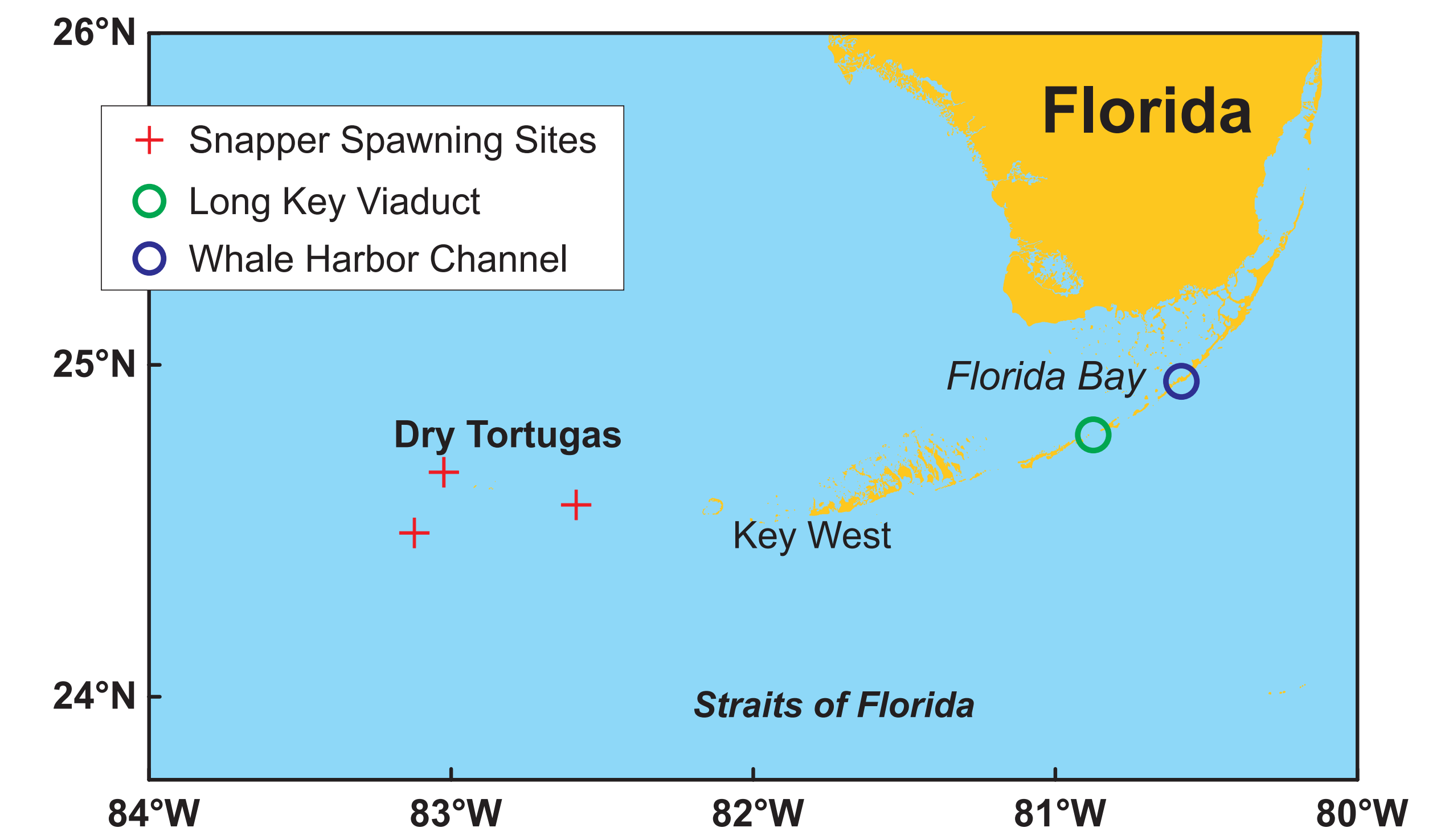


Figure 1. Map of the study area. Sampling sites and locations of known spawning aggregations are indicated.

DATA COLLECTION

• Larval supply was monitored over a two year period from July 1997 to June 1999 using moored plankton nets deployed within two inter-island channels in the Florida Keys (Fig. 1). Nets fished each channel on three consecutive nights around the new moon of each month. Six species of snapper larvae were collected from a total of 249 samples (Fig. 2).

• Larval duration and back-calculated birthdates were estimated from daily otolith increment counts for six species of snappers (Fig. 3).

• The development of the Loop Current and presence of a cyclonic recirculation feature (Tortugas Gyre) in the vicinity of known spawning aggregation sites (Fig. 1) was monitored using remote sensing measures (Fig. 5–6).

Spawning Season for *Lutjanus* spp.

| Species | April | May | June | July | August | September |
|---------------------|-------|-----|------|------|--------|-----------|
| <i>L. analis</i> | | | | | | |
| <i>L. apodus</i> | | | | | | |
| <i>L. chrysurus</i> | | | | | | |
| <i>L. griseus</i> | | | | | | |
| <i>L. synagris</i> | | | | | | |

Table 1. Months in which snapper spawning aggregations form off the Dry Tortugas (Lindeman et al., 2000).

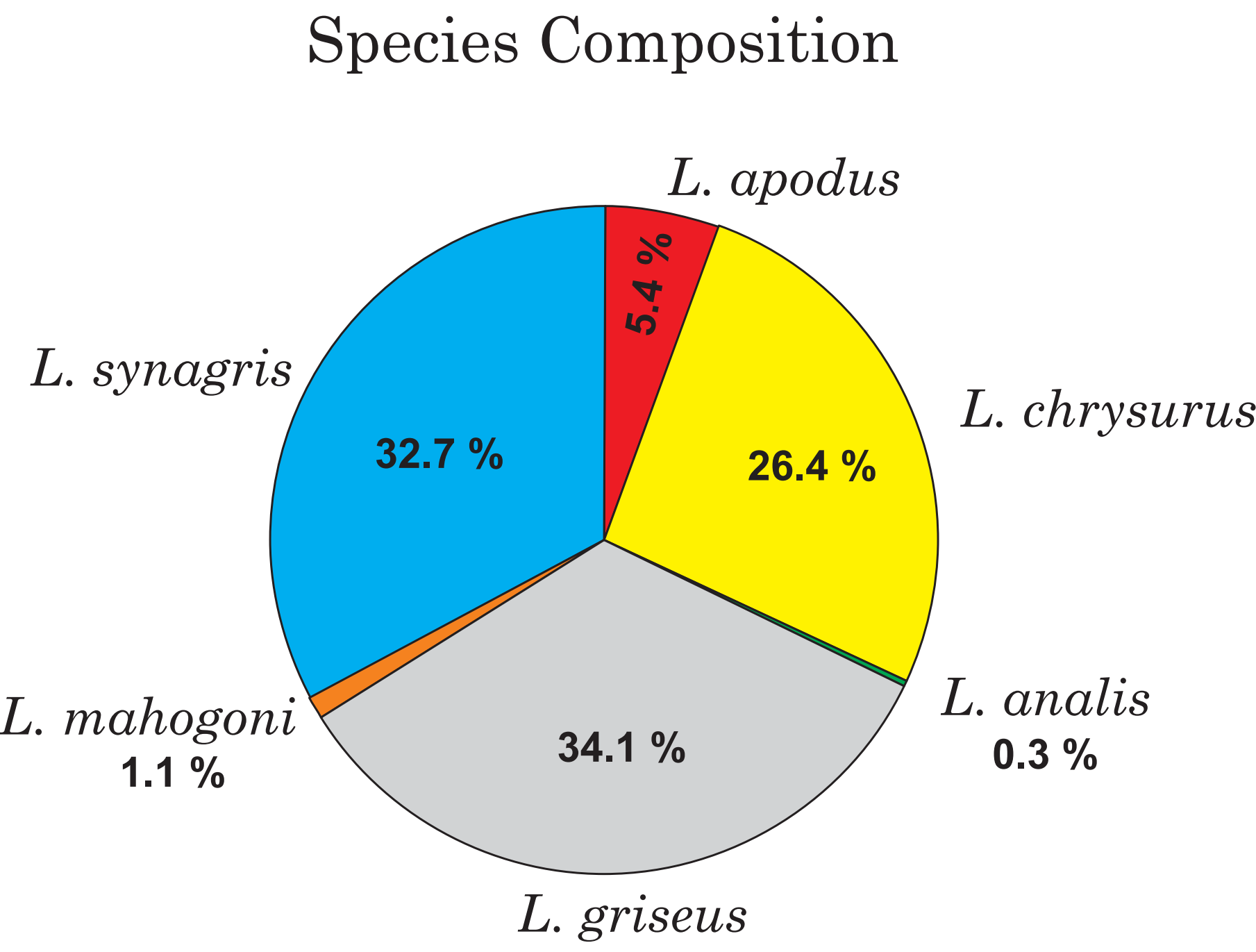


Figure 2. Species composition as percentage of total catch of snapper larvae over entire sampling period.

RESULTS

• Peak abundances of snapper larvae entering Florida Bay occurred in the summer of 1997 (Fig. 4).

• Back-calculated spawning dates estimated from otolith increment analysis, together with the timing of peaks in larval influx, indicate spawning occurred near the full moon during periods of known spawning aggregation formation off the Dry Tortugas (Table 1).

• Satellite alimetry plots indicate high variability in the latitudinal intrusion of the Loop Current and in presence/absence of the Tortugas Gyre.

Age at Settlement

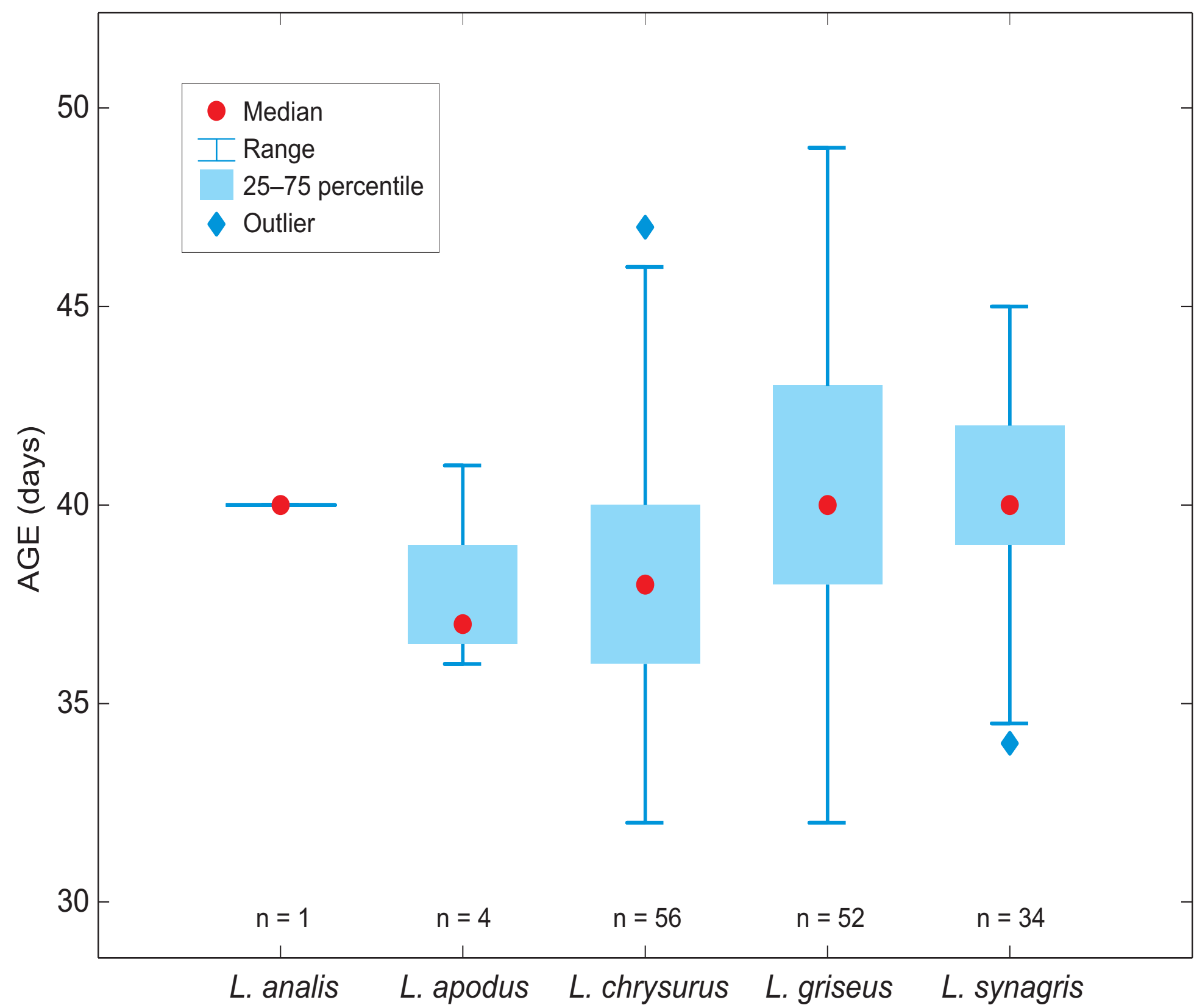
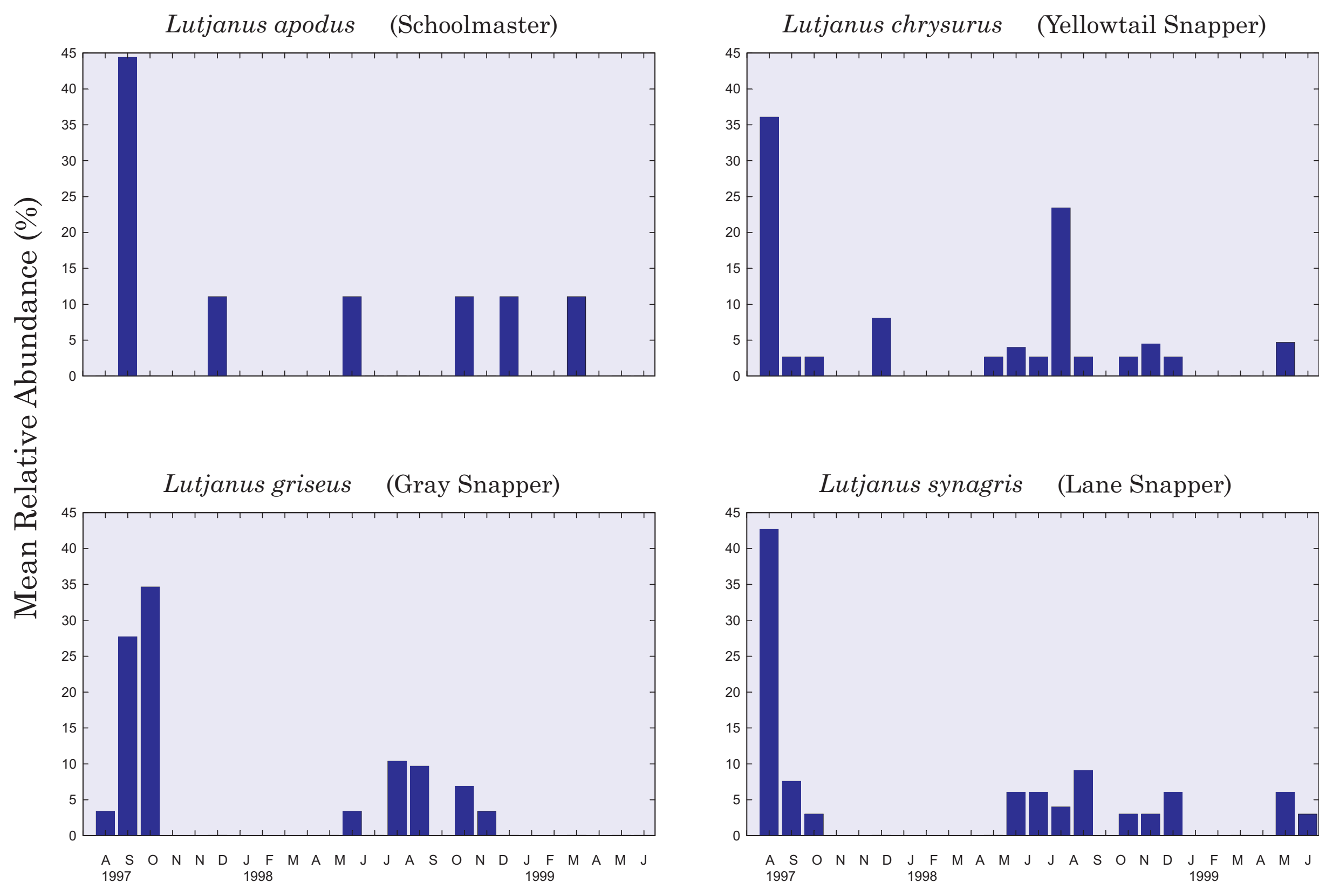


Figure 3. Boxplot depicting pelagic larval durations of snapper larvae entering Florida Bay estimated from counts of daily otolith increments.

Long Key Viaduct



Whale Harbor

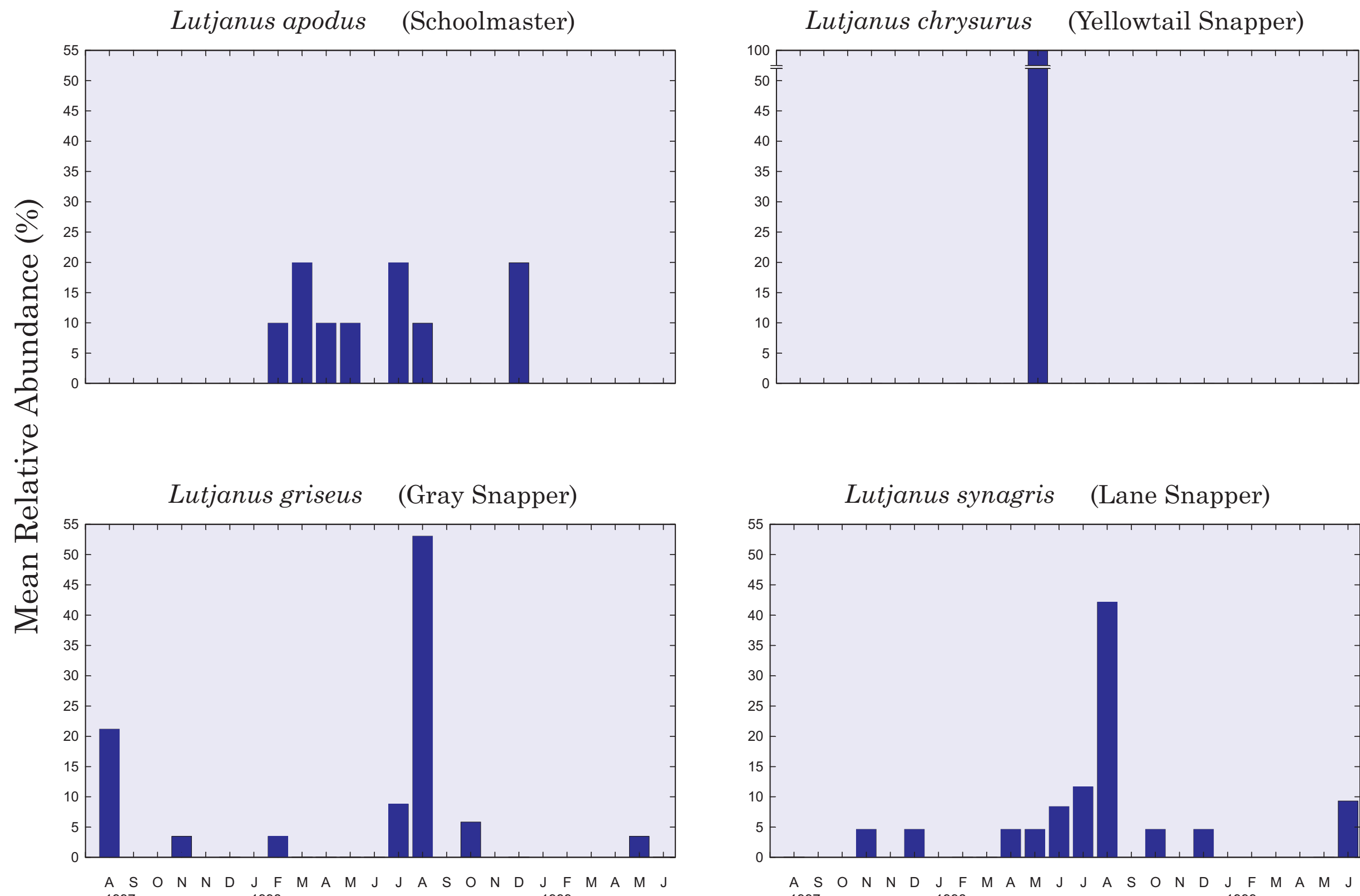


Figure 4. Mean relative abundance (%) of snapper larvae entering Florida Bay through each of two sampling sites over the entire period of the study. Approximately 75% of the total catch occurred at the Long Key site.

CONCLUSIONS

We hypothesize that gyre presence during the spawning season enhances snapper year class strength in Florida Bay via:

- larval retention
- nutrient-enrichment of the pelagic larval habitat through gyre-induced upwelling.

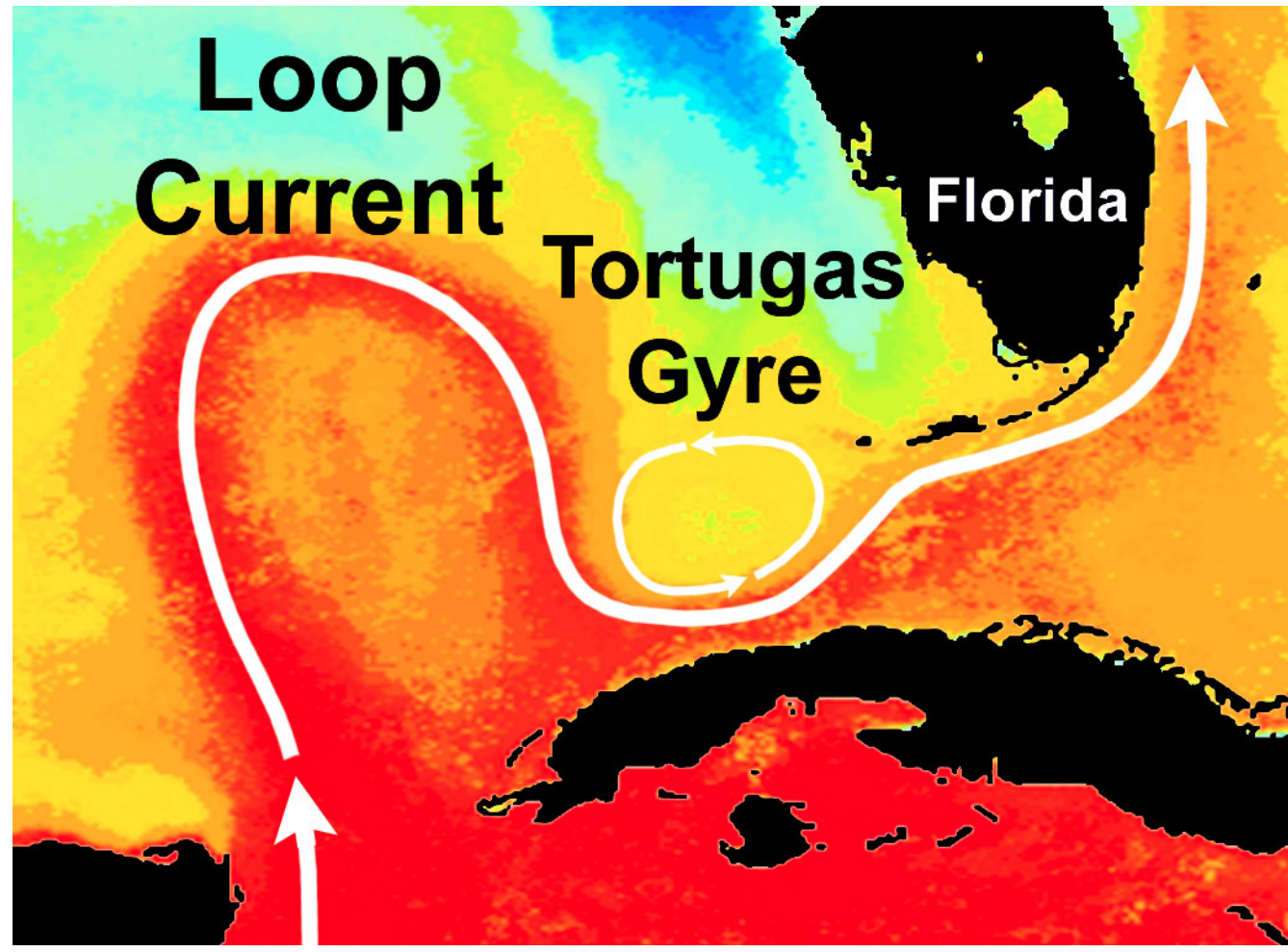


Figure 5. Sea surface temperature map depicting the presence of the cold-core, cyclonic Tortugas Gyre that forms when the Loop Current exhibits high latitudinal intrusion into the Gulf of Mexico. Warm waters are red, cooler waters are blue.

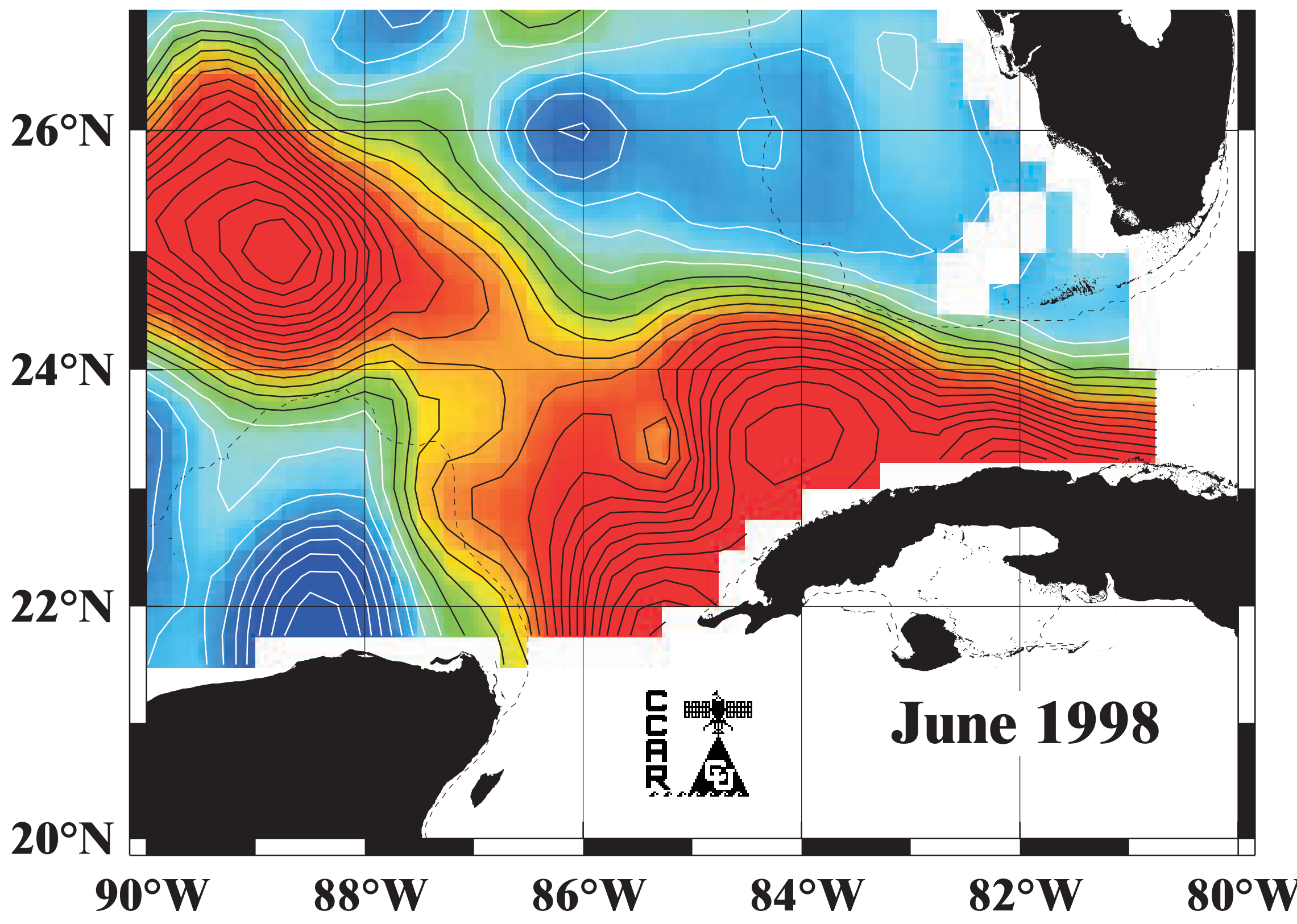
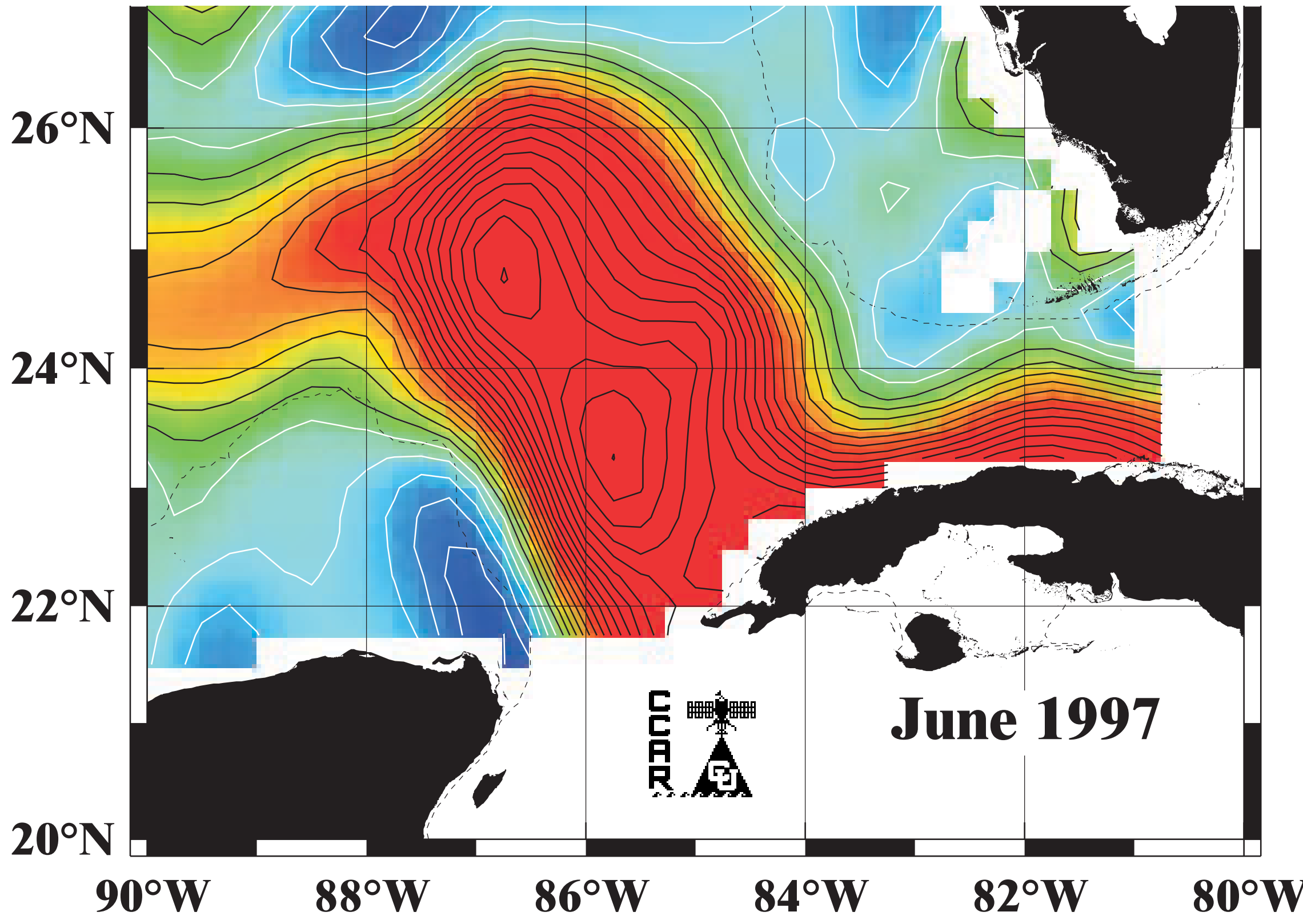


Figure 6. Satellite altimetry plots depicting sea surface height (range: -30 to 30 cm). In 1997 the Loop Current is well developed and a Tortugas Gyre is present. In 1998 no gyre is present.